COURSE INFORMATION

Catalog Description: Selected topics in vector analysis, coordinate transformations, Fourier series, Legendre and Bessel functions, and partial differential equations. Emphasis on practical applications in physics. Spring semester of even years. (3 credit hours)

Prerequisites: PH231/031 General Physics II
MA350 Differential Equations I or consent of instructor

Time and Place: 10:00-10:50 MWF, DH216


Instructor: Dr. Tansil, office RH319A, phone 651-2387, e-mail jtansil@semo.edu
Office hours 3:00-4:00 MWR (perhaps other times if I’m not too busy)
Course web site http://cstl-csm.semo.edu/jtansil/ph570/

COURSE OBJECTIVES

1. To provide students with fundamental knowledge of mathematical physics, including the topics of vector field theory, coordinate transformations, Fourier (harmonic) analysis, orthogonal functions (Bessel, Legendre, etc.), partial differential equations, and boundary-value problems.

2. To introduce students to advanced mathematical techniques that are necessary for solving problems in the various branches of physics, such as classical mechanics, thermodynamics, electromagnetics, optics, and quantum mechanics.

3. To acquaint students with the availability of reference material such as the various handbooks and tables of mathematical functions, computational software (MATLAB, VPython, etc.), and Internet URLs devoted to physics-related data.

4. To acquaint students with recent developments in physics through such references as the (highly recommended) web address http://www.physicscentral.com/ from the American Physical Society and the monthly publication Physics Today from the American Institute of Physics.

EXPECTATIONS OF STUDENTS

1. Attend class regularly, participate in classroom discussions, work all assigned homework problems, and demonstrate competence in the subject matter by performing satisfactorily on quizzes and tests.

2. Develop the ability to solve selected mathematical physics problems with the analytical methods learned in the course.

3. Demonstrate originality in the solutions of selected problems.
HOMEWORK & QUIZZES

Homework will be assigned on a regular basis throughout the semester. Students are expected to work all homework assignments and come prepared to class to discuss the homework.

Quizzes will be given periodically to gauge student comprehension of the material.

GRADING

Grading is objective and is based on three tests and quizzes.

The distribution of points is as follows:

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Letter Grade (approximate)</th>
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<tbody>
<tr>
<td>Tests (3 @ 25%)</td>
<td>75%</td>
<td>90 – 100% ...... A</td>
</tr>
<tr>
<td>Quizzes</td>
<td>25%</td>
<td>80 – 90% ........ B</td>
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<td>65 – 80% ........ C</td>
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<td>Total</td>
<td>100%</td>
<td>50 – 65% ........ D</td>
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<td>0 – 50% ......... F</td>
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LECTURE SCHEDULE

Chap.3 Vector algebra: unit vectors, dot and cross product.
Chap.6 Vector fields: gradient, divergence, curl, line integrals, Gauss’s Law, Stoke’s theorem.

Exam Friday, February 17, 2012

Chap. 10 Coordinate transformations: scale factors, basis vectors, orthogonal curvilinear coordinates.
Chap. 7 Fourier series: expansion of functions, harmonic analysis, applications, Parseval’s theorem.

Exam Monday, April 2, 2012

Chap. 12 Series solutions of differential equations: Legendre polynomials, Bessel functions, orthogonality of functions.
Chap. 13 Partial differential equations & boundary value problems: Laplace’s equation, wave equation, heat flow equation, transient and steady-state solutions.

Exam 10:00am, Monday, May 7, 2012